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Relationships among E-Learning Systems, Self-Efficacy, and E-Learning Outcomes: A Path Analysis Model

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RELATIONSHIPS AMONG E-LEARNING SYSTEMS, SELF-EFFICACY, AND E-LEARNING OUTCOMES: A PATH ANALYSIS MODEL

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Abstract:

In this study, path analysis modeling is applied to examine the relationships among e-learning systems, self-efficacy, and students' perceived learning outcomes in the context of university online courses. Independent variables included in the study are e-learning system quality, information quality, computer self-efficacy, system-use, self-regulated learning behavior, and user satisfaction as potential determinants of online learning outcomes. A total of 674 valid unduplicated responses from students who have completed at least one online course at a university in the Midwest were used to fit the path analysis model. The results indicated that system quality, information quality, and computer self-efficacy all affected system use, user satisfaction, and self-managed learning behavior. But our data failed to show the two relationships: system quality is not positively related to system use; and computer self-efficacy is not positively related to user satisfaction. Two mediating variables (user satisfaction and self-regulated learning behavior) affected students' e-learning outcomes. But our model failed to see the effect of systems use on e-learning outcomes.

Keywords: path analysis, e-learning systems, self-efficacy, perceived learning outcomes

I. INTRODUCTION

An important goal of e-learning systems is to deliver instructions that can produce equal or better outcomes than face-to-face learning systems. The primary objective of this study is to investigate the determinants of students' perceived learning outcomes and satisfaction in university online education using e-learning systems. Using the extant literature, we begin by introducing and discussing a research model illustrating variables affecting e-learning systems outcomes and user satisfaction. We follow this with a description of the cross-sectional survey that was used to collect data and the results from a path analysis model. In the final section, we outline the implications of the results for higher educational institutions.

The research model we developed is a blend of a management information systems (MIS) success model (DeLone & McLean, 1992), a conceptual e-learning model of Piccoli, Ahmad and Ives (2001), and an e-learning success model of Holsapple and Lee-Post(2006). Based on the review of 180 empirical studies, DeLone and McLean presented a more integrated view of the concept of information systems (IS) success and formulated a more comprehensive model of IS success. Their IS success model identified six constructs that are interrelated and interdependent -- system quality, information quality, use, user satisfaction, individual impact, and organizational impact. DeLone and McLean's (DeLone & McLean, 2003) model is further extended and adapted to e-learning settings by many e-learning systems research. The framework of Piccoli, Ahmad, and Ives (Piccoli, Ahmad, & Ives, 2001) refers to human and design factors as antecedents of learning effectiveness. Human factors are concerned with students and instructors, while design factors characterize such variables as technology, learner control, course content, and interaction. Holsapple and Lee-Post (2006) adapted the DeLone and McLean model to propose e-learning success model.
The proposed e-learning success model consists of three antecedents constructs (system quality, information quality, service quality) and two intervening constructs (system use and user

satisfaction) and system outcome measuring academic success and systems efficiency and effectiveness (Figure 2).

II. E-LEARNING SYSTEMS AND SYSTEMS OUTCOMES

The e-learning systems literature has accumulated a considerable body of literature over the past decade (Arbaugh et al., 2009). Nevertheless, little empirical research exists to understand the relationships among e-learning systems quality, the quality of information produced by e-learning systems and e-learning systems outcomes.

E-learning systems comprised of a myriad of subsystems that interacts each other**.** An increasing number of empirical studies have been conducted over the past decades to address the issue of what antecedent variables affect students' satisfaction n and learning outcomes. In a study of Eom and others (2006), structural equation modeling is applied to examine the determinants of students' satisfaction and their perceived learning outcomes in the context of university online courses. Independent variables included in the study are course structure, instructor feedback, self-motivation, learning style, interaction, and instructor facilitation as potential determinants of online learning. A total of 397 valid unduplicated responses from students who have completed at least one online course at a university in the Midwest were used to examine the structural model. The results indicated that all of the antecedent variables significantly affect students' satisfaction. Of the six antecedent variables hypothesized to affect the perceived learning outcomes, only instructor feedback and learning style are significant. The structural model results also reveal that user satisfaction is a significant predictor of learning outcomes. The findings suggest online education can be a superior mode of instruction if it is targeted to learners with specific learning styles (visual and read/write learning styles), and with timely, meaningful instructor feedback of various types. Eom and others found that all six factors—course structure, self-motivation, learning styles, instructor knowledge and facilitation, interaction, and instructor feedback—significantly influenced students' satisfaction. This is in accordance with the findings and conclusions discussed in the literature on student satisfaction.

This research further extends the study of Eom and others (2006) which did not include several constructs on which this study focuses. This research addresses the effects of system quality, information quality, self-regulated learning, and self-efficacy on the e-learning system use, user satisfaction, and e-learning outcomes. An e-learning system typically consists of Learning Management Systems (LMS) and authoring systems. The LMS is a system for storing and delivering the course content, and tracks student access and progress. The authoring systems allow the instructors to develop the contents for e-learners.

III. RESEARCH MODEL AND DATA

The research model was tested using path analysis. LISREL 8.70 was used to do path analysis. It is a technique to assess the causal contribution of directly an observable variable to other directly observable variables. Unlike structural equation modeling that is concerned with latent variables, path analysis examine the causal contribution of directly observable variables. The model consists of three independent variables (system quality, information quality, and self-efficacy) and 4 dependent variables (system use, user satisfaction, self-regulated learning behavior, and e-learning Outcomes). The survey questionnaire is in part adapted or selected from the survey originally developed by Wang et al (Wang, Wang, & Shee, 2007) for the business e-learning environment. The survey instrument consisted of 35 questions addressed using a seven point Likert scale ranging from "strongly disagree" to "strongly agree." In addition, students were asked six demographic-type questions. A total of 674 valid unduplicated responses from students who have completed at least one online course at a university in the Midwest were used to fit the path analysis model.

IV. MODEL TESTING and EVALUATION

Model testing is to test the fit of the correlation matrix of sample data against the theoretical causal model built by researchers based on the extant literature. As figure 3 shows, goodness of fit statistics include an extensive array of fit indices that can be categorized into six different subgroups of statistics that may be used to determine model fit. For a very good overview of LISREL goodness- of-fit statistics, readers are referred to (Byrne, 1998, pp.109-119.; Eom, 2011; Hooper, Coughlan, & Mullen, 2008).

There seems to be an agreement among SEM researchers that it is not necessary to report every goodness of fit statistics from path analysis output. Although there are no golden rules that can be agreed upon, Table 1 includes a set of indices that have been frequently reported and suggested to be reported in the literature (Boomsma, 2000; Crowley & Fan, 1997; Hayduk, Cummings, Boadu, Pazderka-Robinson, & Boulianne, 2007; Hooper, Coughlan, & Mullen, 2008; Kline, 2005; McDonald & Ho, 2002) (Hoyle & Panter, 1995). Table 1 includes our model fit statistics of various fit indices and corresponding acceptable threshold levels of each corresponding fit index. Considering all indices together, the specified model seems to be supported by the sample data. Since our model is tested bas on sample size of 674, Chi-Square statistic is not a good measure of goodness of fit, since Chi-Square statistic nearly always rejects the model when large samples are used(Bentler & Bonnet, 19809). The RMSEA is the second fit statistic reported in the LISREL program. A cut-off value close to .069 indicates a close fit and the values up to 0.08 are considered to represent reasonable error of approximation (Jöreskog & Sörbom, 1993).

V. CONCLUSION AND DISCUSSIONS

Abundant e-learning empirical research points that superior e-learning outcomes are one of the critical objectives of e-learning research. Our path analytical model suggests that of the six variables we hypothesized all of them are useful predictor of e-learning outcomes, except the following three unsupported hypotheses. First, system quality did not lead to a higher level of system use. Second, computer self-efficacy is not positively related to e-learner satisfaction. Third, system use is not positively related to online learning outcomes.

The practical implications of the findings are very crystal clear. In order for e-learning students to be successful, they must be provided with e-learning system that provides information they need and user-friendly. Moreover, they must be able to self-manage the entire learning process including self-regulation of behavior, motivation, and cognition, proactively and deliberately. Although system quality (user- friendly system) has not directly contributed to predict e-learning outcomes, its effects are indirect. System quality and information quality have positive effect on user satisfaction. Information quality has also positive effects on system use, which in turn positively contributes user satisfaction. Therefore, all the antecedent variables are positively affecting e-learning outcomes either indirectly or directly. Nevertheless, there are some cause variables and intervening variables that must be carefully managed to ensure the quality of e-learning outcomes which are equal to or better than face-to-face class. They are computer self efficacy, self-regulated learning behavior, and user-satisfaction.

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